
Two New Species of *Stereospermum* (Bignoniaceae) from Madagascar

Martin W. Callmander

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A, and
Conservatoire et Jardin botaniques de la ville de Genève, ch. de l'Impératrice 1, case postale 60,
CH-1292 Chambésy, Switzerland. martin.callmander@mobot.org

Peter B. Phillipson

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A., and
Muséum national d'Histoire naturelle, Département de Systématique et Évolution, UMR 7205,
Case Postale 39, 57 rue Cuvier, F-75231 Paris cedex 05, France. peter.phillipson@mobot.org

George E. Schatz

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.
george.schatz@mobot.org

ABSTRACT. A recent review of the Malagasy Bignoniaceae for the Catalogue of the Vascular Plants of Madagascar has led to the discovery of two new species in the genus *Stereospermum* Cham.: *S. gentryi* Callm., Phillipson & G. E. Schatz and *S. randrianaiivoi* Callm., Phillipson & G. E. Schatz. *Stereospermum gentryi* is unique in having leaflets spotted with red glands that give a reddish color when dry, and a long, lax, paniculate inflorescence bearing flowers with large corollas that are red-purple inside the mouth and throat. *Stereospermum randrianaiivoi* can be distinguished by its usually 3-foliolate leaves with thick, coriaceous leaflets that are discolorous, with the adaxial surface drying pinkish green and the upper surface a dull gray-green, and shiny in vivo. Both of the new species are provided with illustrations, a discussion of their morphological affinities, and a conservation threat analysis based on the IUCN Red List Criteria.

RÉSUMÉ. Une révision récente de la famille des Bignoniaceae pour le Catalogue des plantes de Madagascar nous permet de découvrir deux nouvelles espèces dans le genre *Stereospermum* Cham.: *S. gentryi* Callm., Phillipson & G. E. Schatz and *S. randrianaiivoi* Callm., Phillipson & G. E. Schatz. *Stereospermum gentryi* est unique possédant des folioles à limbe tacheté de glandes rouges donnant un aspect rougeâtre sur le sec et une longue et diffuse inflorescence portant des fleurs à large corolles dont l'intérieur de la gorge et de la bouche est rouge pourpre. *Stereospermum randrianaiivoi* peut être distingué par ses feuilles généralement à 3-folioles, son limbe coriace, épais, discolore qui sèche de façon rosâtre (brillant in vivo). Les deux nouvelles espèces

sont décrites avec des illustrations, une discussion sur leurs affinités morphologiques ainsi que l'évaluation préliminaire du statut de conservation suivant les critères de l'UICN.

Key words: Bignoniaceae, IUCN Red List, Madagascar, *Stereospermum*.

Madagascar is the second largest center of Bignoniaceae diversity in the world after South America, with ca. 80 currently accepted species (and numerous varieties) in nine genera (Perrier de la Bâthie, 1938a, 1938b; Capuron, 1960, 1970; Gentry, 1977; Zjhra, 2006). A recent review of the Malagasy Bignoniaceae for the Catalogue of the Vascular Plants of Madagascar (<<http://www.efloras.org/madagascar>>) has enabled us to refine taxon delimitations and has led to the discovery of new species in other genera in the family, including *Colea* Bojer ex Meisn. (Callmander & Phillipson, 2012), *Ophiocolea* H. Perrier (Callmander et al., 2011), and *Rhodocolea* Baill. (Callmander & Phillipson, 2011).

Stereospermum Cham. is distributed from Africa (four species) and Madagascar (12 spp., of which two are described in this article), to southern and southeastern Asia (four spp.). The genus can be recognized easily by its flowers with a narrowly cylindrical corolla tube and its cylindrical, podlike fruit with a bony seed chamber possessing alternating deep cavities in which the seeds are lodged (Schatz, 2001). The high level of species diversity in Madagascar corresponds to considerable morphological diversity, with the genus distributed throughout much of the country and occurring in varied habitats and on different substrates. Certain species are quite

widespread, notably *S. euphorioides* DC., while others are locally endemic; however, the greatest species diversity is in the dry forests of the west and north, and the sub-arid forests and thicket of the southwest. The distribution ranges of several species overlap and we concur with previous botanists who have observed intermediate individuals at several localities in Madagascar that they considered to be the result of hybridization. The existence of intermediates has rendered species limits in *Stereospermum* difficult to determine, and we suggest that introgressive hybridization may be a likely cause of the variability that is found in certain species. In this article, we provide descriptions of two highly distinct new species of *Stereospermum*. One of the new species is known only from a single locality in the southeast of Madagascar rather isolated from known subpopulations of any other species, and its morphology is very distinct from that of all other known species. The second species is also morphologically distinct, it is confined to the dry north, and it is probably closely related to *S. boivini* (Baill.) H. Perrier and *S. undatum* H. Perrier, which also both occur in this area. For the two new species, we provide drawings and preliminary IUCN Red List assessments, which have proven valuable for ongoing conservation efforts (see Callmender et al., 2007). We believe that other undescribed species are present in Madagascar, but currently the available material is inadequate to delimit them adequately, and work on the genus is ongoing.

1. *Stereospermum gentryi* Callm., Phillipson & G. E. Schatz, sp. nov. TYPE: Madagascar. Toliara: Anosy, Andohahela RN, Parcelle 1, 33 km N on rd. to Ranomafana from Rte. Nationale, 24°45'10"S, 46°51'15"E, 480 m, 24 Mar. 1992 (fl.), P. B. Phillipson, R. A. Clement & G. Rafamantanantsoa 3979 (holotype, MO [MO-021570]; isotypes, K, MO [MO-021586], P [P00730625], TAN). Figure 1.

Haec species a congeneris madagascariensibus foliis ad minimum 21 lamina adaxialiter glandulis rubris punctata in sicco rubescente, inflorescentia longa laxa paniculata atque corolla grandi fauce oreque intus rubropurpureis distinguitur.

Tree to 10 m with spreading branches. Leaves imparipinnate, opposite, 55 × 35 cm (including petiole); petiole 9–11 cm, ca. 0.4–0.5 cm diam., pubescent, brown-red; leaflets at least 21, lanceolate, (10–)15–17 × 3–5 cm, thin, soft, with rusty indument when young, discolourous, base attenuate, apex acuminate, acumen ca. 1 cm, margins entire, primary and secondary veins prominent on the

adaxial surface, with white long hairs; adaxial surface densely spotted with red glands; abaxial surface puberulent, dark green when dry; petiolule 0.2–0.4 cm (basal leaflets) to 2 cm (terminal leaflets). Fertile branches producing solitary inflorescences at alternate nodes; inflorescence a long, lax panicle (ca. 20–30 cm), bearing 14 to 16 flowers, the leaf subtending the inflorescence about half the length of the opposing leaf and with about half as many leaflets, which are about half the length and width of the leaflets of the opposing leaf; inflorescence branches and flowers subtended by filiform bracts up to 2.5 cm long, with a rusty indument; pedicel ca. 15 mm; calyx tubular, 15 mm, with red glands outside; corolla trumpet-shaped, 70–80 × 4–4.5 mm, white tinged pink outside, shading to pale yellow at the base with minute red-purple spots, the throat and mouth red-purple inside, the 5 lobes all on the proximal side, 20 mm deep, sparsely covered with short white hairs outside; stamens 38 mm included within the corolla tube; ovary with peltate style, 35 mm. Fruit unknown.

Distribution and habitat. *Stereospermum gentryi* is endemic to the evergreen humid forests near Tolagnaro, in southeastern Madagascar (Fig. 2) at elevations between 300 and 700 m.s.m.

IUCN Red List category. *Stereospermum gentryi* is known only from three collections in very close proximity to one another in the humid forest of Andohahela National Park (parcel 1). There is currently no threat on this forest, and therefore in the absence of additional data on population size, the most appropriate preliminary assessment is to assign the new taxon the category of Least Concern (LC), according to IUCN criteria (2001).

Phenology. Flowering material of *Stereospermum gentryi* has been collected in January, March, and April. No fruiting specimens have yet been observed.

Etymology. This species is named in honor of Alwyn H. Gentry (1945–1993) who already recognized this species as new, having annotated a sheet of the type we have chosen with the unpublished name "*Colea cava*." Al Gentry was a Bignoniaceae specialist who worked mainly in the Neotropics but visited Madagascar in 1974, 1985, and 1988, where he made more than 1300 collections and undertook ecological plot samples at several localities as part of a global data set (Phillips & Miller, 2002). He collected many Bignoniaceae in Madagascar, but not *Stereospermum gentryi*.

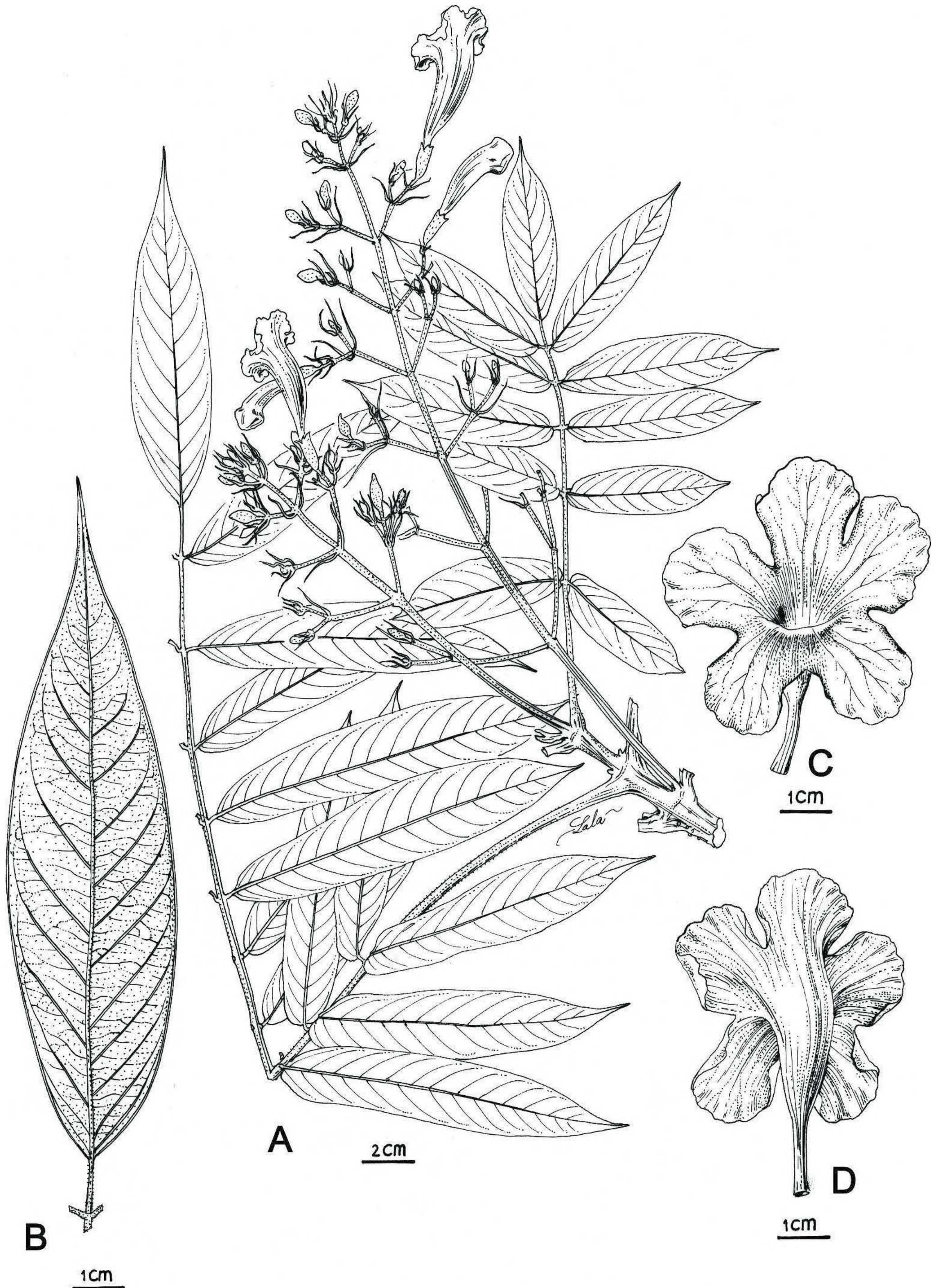


Figure 1. *Stereospermum gentryi* Callm., Phillipson & G. E. Schatz. —A. Fertile branching with inflorescence. —B. Detail of a leaf. —C. Ventral view of a flower. —D. Dorsal view of a flower. Drawn from isotype *P. B. Phillipson, R. A. Clement & G. Rafamantanantsoa 3479* (TAN). Scale bars: A = 2 cm; B–D = 1 cm.

Observations. *Stereospermum gentryi* is distinguished from other Malagasy *Stereospermum* by its leaves with 21 leaflets or more, with the lamina adaxially spotted with red glands giving a reddish

color when dry, and with a reddish brown indument on both blade surfaces. Also distinctive are the large trumpet-shaped corollas (70–80 mm long) with the throat and mouth red-purple inside, the tube

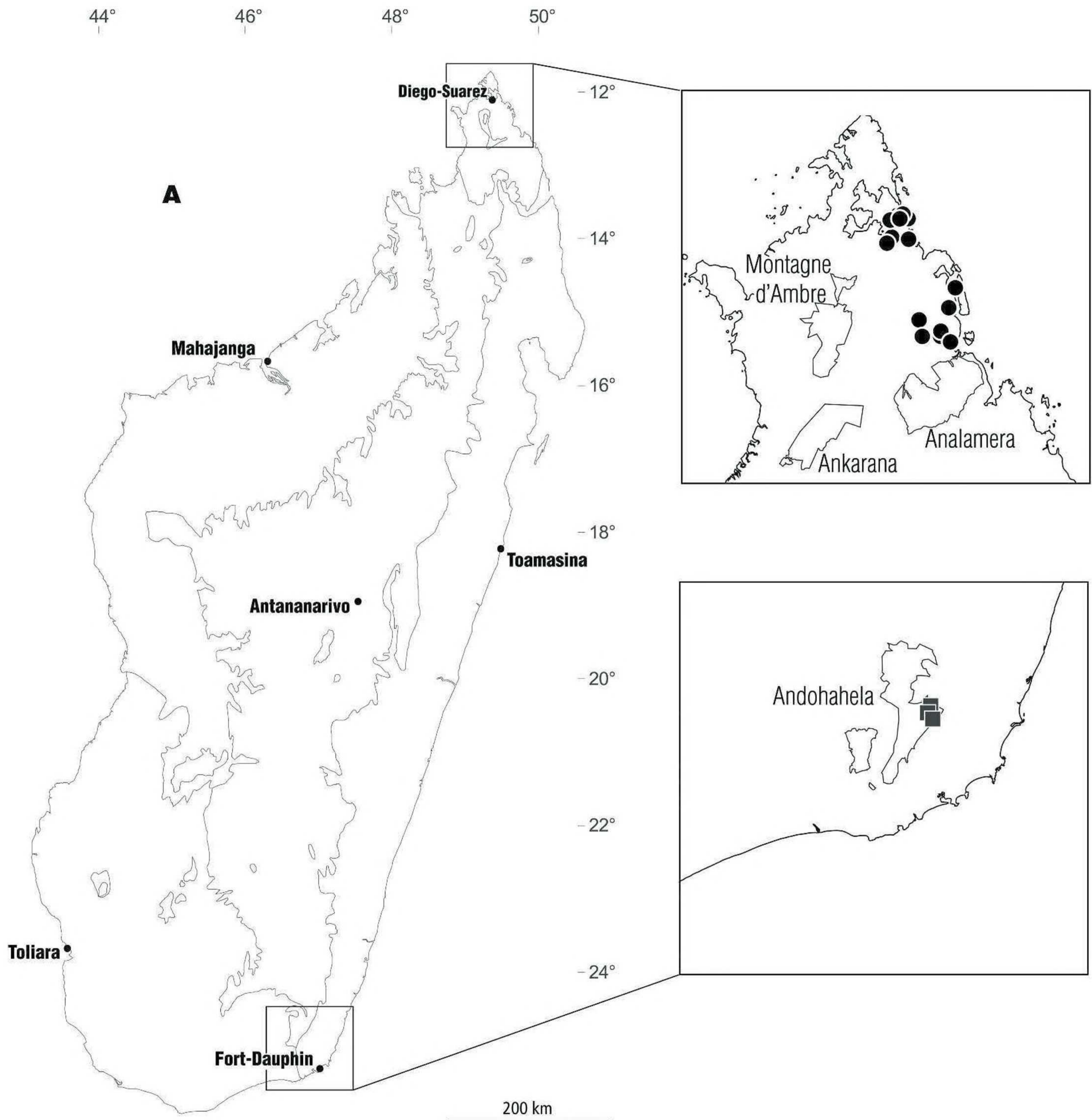


Figure 2. Distributions of the two new species of *Stereospermum* mapped on the bioclimatic zones of Madagascar (after Cornet, 1974; see Schatz, 2000): *S. gentryi* Callm., Phillipson & G. E. Schatz (squares) and *S. randrianaivoi* Callm., Phillipson & G. E. Schatz (circles).

expanding gradually to the mouth, and the long, lax paniculate inflorescence (ca. 20–30 cm long), quite unlike those of any other species in the genus, which are mostly white, smaller (under 60 mm long), narrowly tubular and expanding abruptly at the mouth, and borne in a smaller inflorescence. In Madagascar, only a single species of *Stereospermum* has larger flowers: *S. longiflorum* Capuron. It is endemic to dry forest of the extreme north, the flowers are white, and the inflorescence is highly reduced.

Paratypes. MADAGASCAR. **Toliara Prov.:** Andohahe-la RN, E of Ifarantsa–Enakara Ambony Rd., 24°46'S,

46°51'E, 26 Apr. 1988 (fl.), A. J. M. Leeuwenberg, J. Floret, P. P. Lowry & R. Rajemisa 13962 (MO, P, WAG); Anosy, Col du Maningotry, 24°44'S, 46°51'E, 30 Jan. 1990 (fl.), R. Rabevohitra 2253 (MO, P, TAN).

2. *Stereospermum randrianaivoi* Callm., Phillipson & G. E. Schatz, sp. nov. TYPE: Madagascar. Antsiranana Prov.: forêt de Sahafary, [12°34'S, 049°26'E], [50 m], 10 Dec. 1952 (fl. & fr.), *Service Forestier* 6285 (holotype, P [P00730636]; isotypes, G [G00303500], MO [MO-097472], MO [MO-2160847], P [P00730638], TEF). Figure 3.

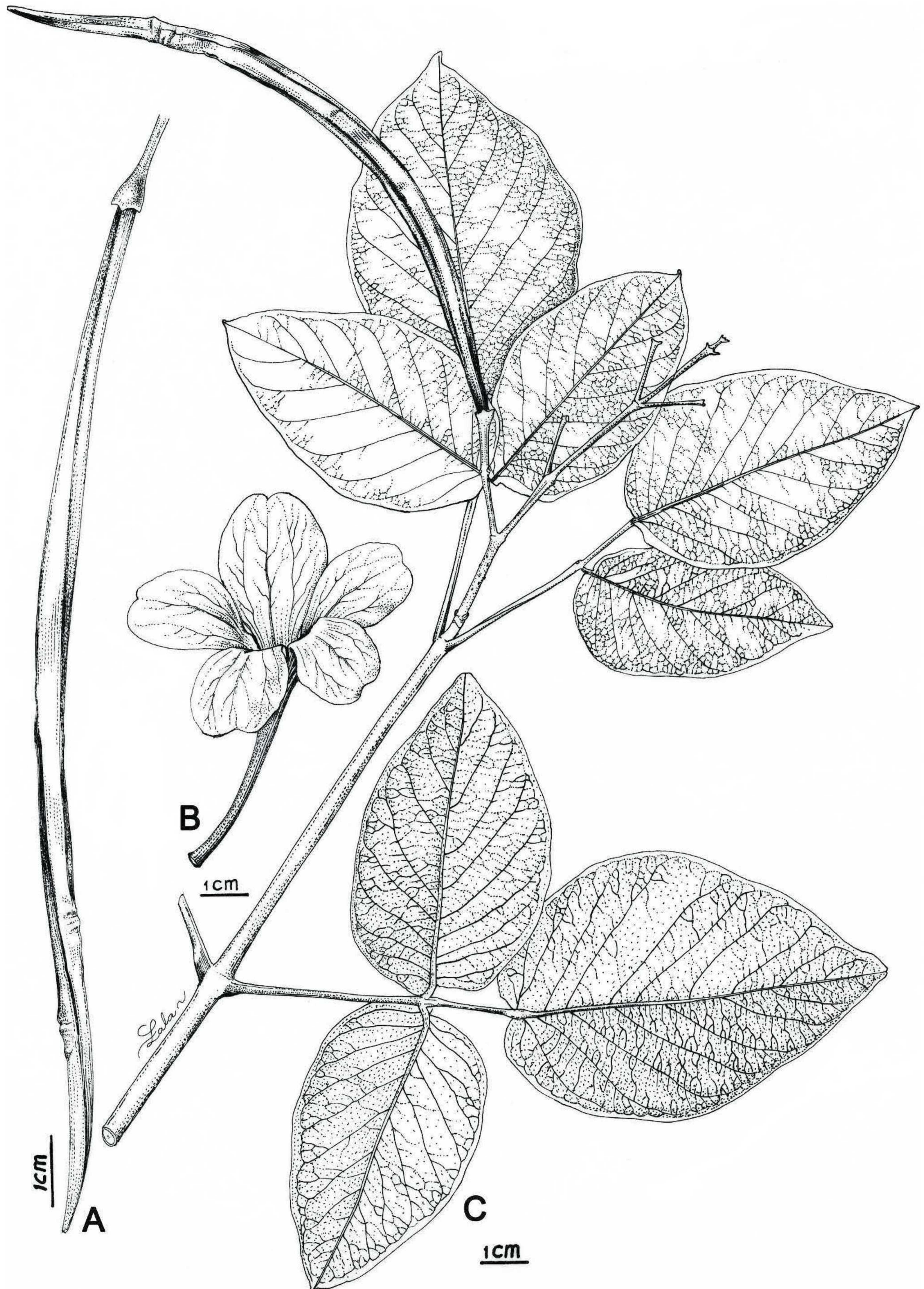


Figure 3. *Stereospermum randrianaiwoi* Callm., Phillipson & G. E. Schatz. —A. Fruit. —B. Flower. —C. Fruiting branch. Sources: A, *M. Bardot-Vaucoulon 1392* (P); B, C, *J. Razafitsalama & R. Ludovic 21* (TAN). Scale bars: A–C = 1 cm.

Haec species a congeneris madagascariensibus foliolis plerumque 3, raro 1 vel 5, lamina coriacea crassa discolori in vivo nitida in sicco adaxialiter subroseo-viridi, venulis tertiariis abaxialiter reticulum densum puberulum formantibus atque corolla tubulari alba lobis patentibus trichomatibus brevibus albis sparsim vestitis distinguitur.

Treelet or tree 3–10 m. Leaves usually 3-foliolate, rarely 5-foliolate, occasionally simple leaves also present, opposite, 15–17 × 12–15 cm (including petiole); petiole 3–6 cm, ca. 0.2 cm diam., puberulent; leaflets subrotund to ovate or obovate,

(4–)5–8(–10) × (2–)3–7(–11) cm, lateral leaflets generally smaller than the terminal one, coriaceous, thick, discoloured; base variable, cuneate to cordate; apex rounded to acute; margin entire; all veins prominent on the adaxial surface with tertiary veins forming a dense pubescent reticulum; abaxial surface white puberulent, drying pinkish green (shiny in vivo); petiolule 2.5 cm (terminal leaflets) to 0.3–0.5 cm (lateral above leaflets). Inflorescence a short panicle, 4–5 cm, with 6 to 8 flowers and glabrous axes; pedicels 20–35 mm; calyx cupuliform, glabrous, 18–22 mm; corolla tubular, 50–60 × 4–4.5 mm, white (black when dried), with 5 spreading lobes, sparsely white puberulent; tube 30 × 2–4 mm, straight; lobes ovoid, longitudinally plicate, spreading, ca. 20(–25) × 15(–25) mm; stamens ca. 20 mm; style 12 mm, stigma laterally flattened. Fruit a dehiscent pod, 10–17 × 0.5–0.8 cm, brownish gray when dry.

Distribution and habitat. *Stereospermum randrianaivoi* is endemic to dry forests in the far north of Madagascar (Fig. 2). This species is known to occur from sea level to an elevation of ca. 120 m.

IUCN Red List category. With an extent of occurrence (EOO) of 443 km², an area of occupancy (AOO) of 108 km², and four subpopulations (calculation following Callmander et al., 2007), none of which are situated within a protected area, *Stereospermum randrianaivoi* is assigned a preliminary status of Endangered (EN B1ab(iii)+2ab(iii)), according to IUCN criteria (IUCN, 2001).

Phenology. *Stereospermum randrianaivoi* has been recorded in flower and fruit from October to June.

Etymology. The species is named in honor of Richard Randrianaivo, who collected this new species. Richard Randrianaivo (1959–) has conducted botanical inventories in many parts of Madagascar and has made an especially important contribution to the understanding of the plant diversity and endemism in the northern dry forests. He was the leader of bio-prospection for natural products for the International Cooperative Biodiversity Groups (ICBG) project undertaken by the Missouri Botanical Garden (MO) and the Centre National d'Application des Recherches Pharmaceutiques (CNARP).

Observations. *Stereospermum randrianaivoi* can be easily recognized by its coriaceous, usually 3-foliolate leaves (rarely 1- or 5-foliolate), with the tertiary veins of the abaxial surface forming a dense

puberulent reticulum, and the adaxial surface of mature leaves usually drying with a pinkish green hue. Perrier de la Bâthie (1938a, 1938b) cited some of the collections we include in the new species under *S. boivinii*. We restrict the latter to its type (*Boivin s.n.*, P) and *Decary 54* (P), both collected near Antsiranana, and *Bardot-Vaucoulon 324* (P) and *Service Forestier 18970* (P) from Ankarana. *Stereospermum boivinii* is distinguished from *S. randrianaivoi* by its shorter, villous calyx (ca. 16 vs. 18–22 mm), the much shorter corolla tube (ca. 18 mm), and the villous indument of the inflorescence axes and pedicels. Another widespread species that extends into the northern dry forests of Madagascar, *S. undatum* can also be confused with *S. randrianaivoi* but differs most noticeably by its glabrescent leaves with more numerous (usually seven or nine) leaflets. In the Loky-Manambato region, several collections, e.g., *Nusbaumer 1945* (G) and *Perrier de la Bâthie 10345* (P), are intermediate between the two species and we suspect that hybridization occurs in this area that is their geographical interface.

Paratypes. MADAGASCAR. s. loc., s.d. (fr.), *R. Baron 6198* (K, P). **Antsiranana:** Commune de Ramena, baie des dunes, 13°14'30"S, 49°22'31"E, 13 May 2004 (fr.), *M. Andrianjafy, J. Razafitsalama, S. Rakotonandrasana, R. Rakotondrajaona, H. Tombondray, R. Guittou, J. Be & V. Benjara 424* (CNARP, MO, P, TAN); Ankarongana, Analafandro, 12°37'50"S, 49°31'28"E, 23 Feb. 2006 (fl. & fr.), *M. Andrianjafy, C. Birkinshaw & Rafaralahy 1625* (CNARP, G, K, MO, P, TAN); Analabolona, 3 km W Irodo, 12°37'21"S, 49°30'01"E, 20 June 2004 (fl.), *J. Be, R. Guittou, J. Razafitsalama & Raymond 10* (CNARP, MO, P, TAN); Montagne des Français, parcelled de York, 12°19'S, 49°20'E, 15 m, 7 Feb. 2003 (fl. & fr.), *M. Bardot-Vaucoulon 1392* (MO, P, TAN); Baie de Rigny, Oct. 1848 (fr.), *L. H. Boivin 2926* (P); Distr. Diégo-Suarez, Orangéa, [12°14'26"S, 49°21'53"E], 22 Jan. 1960 (fr.), *G. Cours & H. Humbert 5411* (MO, P); ca. 6 km from Diégo-Suarez on Diégo-Vovo village rd., 12°19'05"S, 049°23'07"E, 21 Apr. 1993 (fr.), *D. K. Harder, M. C. Merello, S. G. Razafimandimbison & T. G. Razafindrabeza 1663* (MO, P); PK 10 km 500, route de Diégo-Orangéa, [12°16'09"S, 49°20'45"E], 15 Nov. 1970 (fl.), *M. Keraudren & G. Aymonin 25461* (P [2]); Orangéa, environs de Diégo-Suarez, [12°14'S, 49°22'E], 25 Nov. 1970 (fl.), *M. Keraudren & G. Aymonin 25531* (P); Orangéa, près de Diégo, [12°14'39"S, 49°21'41"E], Jan. 1926 (fl. & fr.), *H. Perrier de la Bâthie 17521* (P [2]); Andrafiabe, Ambolobozobe, Andasimavo, à 5 km 'O du village d'Ampanohana, 12°31'00"S, 49°32'00"E, 28 Mar. 2007, *S. Rakotonandrasana, A. Rakotondrafara & Ali 1131* (CNARP, G, MO, P, TAN); Village de Ramena, Orangéa, 12°15'07"S, 49°22'08"E, 20 m, 24 Feb. 1999 (fl.), *F. Randriatafika & F. Ratovoson 19* (MO, P, TAN); Sadjoavato, forêt de Sahafary, 12°36'26"S, 49°26'43"E, 8 Jan. 2007 (fl.), *F. Ratovoson, L. Razanakolona & V. Benjara 1222* (CNARP, MO, P, TAN); Forêt d'Orangéa, 12°14'08"S, 49°22'08"E, 19 Nov. 2001 (fl. & fr.), *R. Randrianaivo, M. Rabarimanarivo, H. Razafindrabe, J. Andriantiana, A. Ratodimanana, T. G. Razafindrabeza & Oliver 783* (MO, P, TAN); Irodo, forêt sur sable d'Analafan-

dro, 12°37'14"S, 49°30'03"E, 24 Feb. 2001 (fl. & fr.), J. Razafitsalama & R. Ludovic 21 (G, MO, P, TAN, TEF, WIS); rd. from Diégo-Suarez to Ramena, along path to Andavakoera, 12°18'57"S, 49°21'39"E, 6 Nov. 2006 (fr.), Z. Rogers, R. Ranaivojaona, C. Davidson, S. R. Christoph & F. Ratovoson 1113 (G, MO, P, TAN); Forêt d'Andranotsimaka, Diégo, 4 Oct. 1952 (fl. & fr.), *Service Forestier* 5786 (MO, P [2], TEF).

Acknowledgments. The authors thank the Parc Botanique et Zoologique de Tsimbazaza, Association Nationale pour la gestion des Aires Protégées (ANGAP), and the local office of the Missouri Botanical Garden in Antananarivo for assistance in Madagascar. We are grateful to Louis Nusbaumer and Nicolas Fumeaux for assistance and Pierre-André Loizeau for support at the Conservatoire et Jardin botaniques de la Ville de Genève as well as Sharon Bodine, Alyse Rothrock, and Zachary Rogers for help with the management of project collections at MO in St. Louis. We thank Martine Bardot-Vaucoulon for sharing her valuable observations of the *Stereospermum* in northern Madagascar, Roy Gereau for preparing the Latin diagnoses, Pete Lowry for valuable discussion and support, Roger Lala Andriamiarisoa for the fine illustrations, and Maria Mercedes Arbo and Breet A. McMillan for the nice review of our article. The authors are also grateful to the curators of the following herbaria for access to their collections: CNARP, G, K, MO, P, TAN, and TEF. Financial support was provided by grants from the U.S. National Science Foundation (0743355) and the Andrew W. Mellon Foundation.

Literature Cited

- Callmander, M. W. & P. B. Phillipson. 2012. Two new species of *Colea* Bojer ex Meisn. (Bignoniaceae) endemic to Madagascar. *Adansonia* 34(1): 115–122.
- Callmander, M. W. & P. B. Phillipson. 2011. Four new species of the endemic genus *Rhodocolea* (Bignoniaceae). *Adansonia* 33(2): 311–321.
- Callmander, M. W., G. E. Schatz, P. P. Lowry II, M. O. Laivao, J. Raharimampionona, S. Andriambololona, T. Raminosa & T. Consiglio. 2007. Application of IUCN Red List criteria and assessment of Priority Areas for Plant Conservation in Madagascar: Rare and threatened Pandanaceae indicate new sites in need of protection. *Oryx* 41: 168–176.
- Callmander, M. W., P. B. Phillipson, M. Razanajatovo & L. Nusbaumer. 2011. The genus *Ophiocolea* H. Perrier (Bignoniaceae) in northern Madagascar with description of four new species and two lectotypifications. *Candollea* 66(1): 133–145.
- Capuron, R. 1960. Contribution à l'étude de la flore forestière de Madagascar. *Notul. Syst. (Paris)* 16: 60–80.
- Capuron, R. 1970. Deux nouvelles Bignoniacées. *Adansonia* 10(4): 501–506.
- Cornet, A. 1974. Essai de Cartographie Bioclimatique à Madagascar. Notice Explicative ORSTOM No. 55. Paris.
- Gentry, A. H. 1977. *Phyllarthron bilabiatum*: A new species of Bignoniaceae from Madagascar. *Ann. Missouri Bot. Gard.* 64(1): 139–141.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- Perrier de la Bâthie, H. 1938a. Les Bignoniacées de la région malgache (Madagascar, Mascareignes, Seychelles et Comores). *Ann. Inst. Bot.-Geol. Colon. Marseille sér* 5, 6(1): 1–101.
- Perrier de la Bâthie, H. 1938b. Bignoniacées. Pp. 8–85 in H. Humbert (editor), *Flore de Madagascar et des Comores. Famille 178*. Imprimerie officielle, Madagascar.
- Phillips, O. & J. S. Miller. 2002. Global Patterns of Plant Diversity, Alwyn H. Gentry's Forest Transect Data Set. *Monogr. Syst. Bot. Missouri Bot. Gard.* 89.
- Schatz, G. E. 2000. Endemism in Malagasy tree flora. Pp. 1–9 in W. R. Lourenco & S. M. Goodman (editors), *Diversity and Endemism in Madagascar. Mémoires de la Société de Biogéographie, Muséum national d'Histoire Naturelle and Office de la Recherche Scientifique et Technique d'Outre-Mer*, Paris.
- Schatz, G. E. 2001. *Generic Tree Flora of Madagascar*. Royal Botanic Gardens, Kew.
- Zjhra, M. L. 2006. New taxa of Coleeae (Bignoniaceae) from Madagascar. I. A collection from Masoala Peninsula. *Ann. Bot. Fenn.* 43: 225–239.